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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/966,689	09/27/2001	Shunpei Yamazaki	07977/286001/US5247	5005

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EXAMINER

CHEN, KIN CHAN

ART UNIT

PAPER NUMBER

1765

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13

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/966,689

Applicant(s)

YAMAZAKI ET AL.

Examiner

Kin-Char. Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) 1-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 27 and 28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 27 recites the limitation "said third" in line 7 from bottom. There is insufficient antecedent basis for this limitation in the claim. For the patent examining purpose, the examiner assumes that it is "said second".

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 15-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Susko et al. (US 4,885,074; hereinafter "Susko") in view of Sill et al. (US 6,431,112 B1; hereinafter "Sill").

Susko teaches an etching method using a dry etching apparatus provided with at least first electrode, second electrode and third electrodes, the first electrode (or third electrode in claim 20) being opposed to the second and third electrodes (or first and

second electrodes in claims 20, 26, 27). a plurality of electrodes (second and third electrodes in claims 15, 22, 24; first and second electrodes in claims 20, 26, 27) are provided below the substrate (high-power sources being independent from each other, e.g., claims 22 and 26) in a chamber. A reaction gas may be supplied into the chamber. A first high-frequency power may be applied to an electrode disposed below a central portion of the substrate and second high-frequency power may be applied to the electrode (or electrodes) disposed below the edge portions of the substrate to supply an AC electric field between the first electrode and second electrode and third electrodes. The plasma may be generated (with a magnetic field or an electric field, claim 18) between the first electrode and the second and third electrodes. A plurality of high power sources independently connected to each of the plurality of electrodes (claims 22 and 26). A material film on the substrate may be etched. (col. 3, lines 32-54; col. 4, lines 16-32 and Figs 3-6; col. 5, lines 7-21). The wafer can be processed uniformly and the etching from the center of workpiece and the edges of workpiece has the same extent (col. 4, lines 30-32; col. 5, lines 18-20).

Susko discloses that the plasma reactor is capable of sustaining a vacuum (abstract). Susko does not explicitly state supplying a reaction gas into the chamber under a reduced pressure. However, it is conventional for the plasma etching process. Sill is relied on to show that in the plasma processing (e.g., plasma etching), a reaction gas is supplied into the chamber under a reduced pressure (under vacuum) (col. 5, lines 33-37, lines 53-62). Because it is a conventional method in the art of plasma etching and because it is disclosed by Sill, hence, it would have been obvious to one with

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ordinary skill in the art to perform said process step of Susko under reduced pressure as taught by Sill in order to provide their art recognized advantages and produce an expected result.

Susko teaches that the workpiece can be a semiconductor device or any structure to be etched (col. 1, lines 51-53). Susko is not particular about the shape or structure of the workpiece, therefore, it would have been obvious to one with ordinary skill in the art to use workpiece with conventional shapes (e.g., round, rectangular, or square substrates). Hence, **the edges of the substrate comprise the corner portions of the substrates**, as instantly claimed, wherein the electrodes may be disposed.

Susko teaches that the electrode structure may be a sample holder and suitable and conventional mounting mechanisms would be normally used (col. 4, lines 64-65; col. 3, lines 45-46). Therefore, the substrate may be deposited on the plurality of electrodes (e.g., second and third electrodes in claims 15, 22, 24; first and second electrodes in claims 20, 26, 27). The instant claims differ from Susko by specifying the plurality of electrodes below the substrate may be flush with each other. However, in order to generate an uniform field of energized gas for plasma processing and etch material from the center of a workpiece to the same extent as the edges, Susko specifically points out that **any configuration of electrodes relative to one another and relative to a workpiece can be devised** in accordance with the present invention depending on the purpose for which the reactor chamber is used and particular operating requirements (col. 5, lines 41-48). Hence, it would have been obvious to one with ordinary skill in the art to adjust the layout of electrodes such as flush with each

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other as claimed because Susko teaches that **any configuration of electrodes relative to one another and relative to a workpiece can be devised** to generate an uniform field of energized gas for plasma processing.

As to dependent claim 16, Susko teaches using the first high-frequency power and the second high-frequency power. Susko does not disclose the frequency used in its process. It would be obvious to one skilled in the art to use standard 13.56 MHz frequency (see El-kareh (FSPT, p. 285) in the record as evidence) for both power sources because it is extra cost without benefit to use different frequencies for power sources.

As to claim 20, Susko teaches that the workpiece can be a semiconductor device or any structure to be etched. Susko is not particular about the structure of the workpiece being etched, therefore, it would have been obvious to one with ordinary skill in the art to use workpiece with conventional wiring structure of semiconductor device, such as a conductive film formed on the substrate with a mask formed on the conductive film. Hence, it would have been obvious to one with ordinary skill in the art to perform said process steps of Susko in the conventional wiring structure in order to provide their art recognized advantages and produce an expected result.

Claim 29 differs from the combined prior art by specifying five electrodes rather than three electrodes or four electrodes below the substrate in Susko. However, Susko teaches that in order to create an uniform plasma field, it is advantageous to provide a system having two or more independently controlled electrodes (col. 2, lines 49-51) Hence, it would have been obvious to one with ordinary skill in the art to have a plurality

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of electrodes, more than four electrodes as shown in Susko's example, depending on the reactor chamber and particular operating requirements in order to create an uniform plasma field. Claim 29 also specifies the second through fifth electrodes are located below corner portions of the substrate. However, as has been stated above, Susko specifically points out that **any configuration of electrodes relative to one another and relative to a workpiece can be devised** accordance with the present invention depending on the purpose for which the reactor chamber is used and particular operating requirements (col. 5, lines 41-48). Hence, it would have been obvious to one with ordinary skill in the art to adjust the layout of electrodes as claimed because Susko teaches that **any configuration of electrodes relative to one another and relative to a workpiece can be devised** to generate an uniform field of energized gas for plasma processing.

Claims 17, 19, 21, 23, 25, and 28 differ from the prior art by teaching various features well known to the art of semiconductor device fabrication (such as dry etching apparatus in claims 17, 19, and 23; wiring type in claim 21; electronic devices applications in claims 25 and 28). It is the examiner's position that a person having ordinary skill in the art at the time of the instantly claimed invention would have found it obvious to modify Susko and Sill by adding any of same well-known features to same because these features would have been anticipated to provide their art recognized advantages and thus produce an expected result. It is noted that applicant did not

traverse the aforementioned conventionality (e.g., well-known features, conventional process steps), which have been stated in the office action in Paper No. 11.

Response to Arguments

4. Applicant has argued that the cited prior art does not teach that the electrodes below the substrate are flush with each other. It is not persuasive. As stated in the office action, in order to generate an uniform field of energized gas for plasma processing and etch material from the center of a workpiece to the same extent as the edges, Susko specifically points out that **any configuration of electrodes relative to one another and relative to a workpiece can be devised** in accordance with the present invention depending on the purpose for which the reactor chamber is used and particular operating requirements (col. 5, lines 41-48). Hence, it would have been obvious to one with ordinary skill in the art to adjust the layout of electrodes such as flush with each other as claimed because Susko teaches that **any configuration of electrodes relative to one another and relative to a workpiece can be devised** in order to generate an uniform field of energized gas for plasma processing.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. El-Kareh, Fundamentals of Semiconductor Processing

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Technologies (FSPT), page 285, teaches that frequency typically 13.56 MHz is used in plasma etching system.

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (703) 305-0222. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final

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communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-2934.

K-C C
March 3, 2003


Patent Examiner
Group Art Unit 1765